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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/891,730	06/25/2001	Steven Verhaverbeke	004990	1392

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APPLIED MATERIALS, INC.  
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SANTA CLARA, CA 95050

EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 04/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/891,730

Applicant(s)

VERHAVERBEKE ET AL.

Examiner

Lynette T. Umez-Eronini

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 30 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-13, 15-23, 41-53, 56-96, 100, 102, 104, 106, 108-110 and 112 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 41-51; 59-66; 79-96; 100; 102; and 112 is/are allowed.
- 6) ☒ Claim(s) 1-13, 15-23, 52, 53, 56-58, 67-78, 104, 106 and 108-110 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Objections*

1. Claims 1 and 104 are objected to because of the following informalities:

In claim 1, the long-hand name for "EDDHA" is not written; and

In claim 104, "triethylenetetranitrilohexaacetic" is misspelled. Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-13 and 104 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. (US 4,817,652) in view of Morinaga et al. (US 5,885,362).

Liu teaches, "Centrifugal spray cleaning is an effective cleaning alternative to chemical immersion processes . . . As the wafers spin, they are subjected to a series of continuous fine sprays of reagent solution, including a hot aqueous solution of hydrogen peroxide and ammonium hydroxide, . . . and high purity water, which reads on,

A method of processing a wafer comprising: placing a wafer in a single wafer cleaning tool; spinning said wafer in said single wafer cleaning tool and while spinning said wafer; after placing said wafer in said single wafer cleaning tool, exposing said wafer to a solution comprising:  $H_2O_2$ ,  $NH_4OH$ ; and  $H_2O$ .

Liu differs in failing to teach exposing the wafer to a chelating agent, comprising: EDDHA, **in claim 1**; and

triethylenetetranitrilo-hexaacetic acid (TTHA), **in claim 104**.

Morinaga teaches a surface treatment (cleaning) composition, which comprises aqueous ammonia (same as applicants'  $NH_4OH$ ), hydrogen peroxide, and water, and a complexing agent such as EDDHA and TTHA, (column 14, line 66 - column 15, line 4; column 4, line 1-5 and 54-57; and column 7, lines 49-50).

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Liu's cleaning solution by adding EDDHA or TTHA, as taught by Morinaga's for the purpose of preventing metal impurities from being deposited on a substrate surface (Morinaga, column 3, lines 5-11).

5. Claims 106 and 108-110 and are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin as in view of Hayashida et al. (US 5,840,127).

Liu differs in failing to teach cleaning the wafer with desferriferrioxmin B., **in claim 106** and BAMTH, **in claim 108**.

Hayashida teaches treating solutions prepared by adding N,N',N"-tris[2-(N-hydroxycarbamoyl)ethyl]-1,3,5-benzenetricarboxamide (same as applicants' BAMTH) (BAMTPH) or desferrioxamine B (same as applicants' desferriferrioxmin B.) to SC-1 treating (Standard Clean 1 solution consists of a mixture of NH<sub>4</sub>OH, H<sub>2</sub>O<sub>2</sub>, and H<sub>2</sub>O) solution (column 11, lines 12-21; Tables 1 and 3; and column 6, lines 14-23, 55-59).

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Liu's cleaning solution by adding desferriferrioxmin B and BAMTPH, as taught by Hayashida for the purpose of improving surface treating process, which prevents Al contamination caused by adsorption from a treating and which have a high cleaning efficiency metal impurities from being deposited on a substrate surface (Hayashida, column 3, lines 36-41).

6. Claims 15-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu (US '652) in view of Morinaga (US '362) as applied to claim 1 above, and further in view of Olesen et al. (US 5,996,595).

Liu in view of Morinaga differs in failing to teach the solution comprises a surfactant as recited **in claims 15-23**.

Olesen shows a surfactant is introduced with DI water, NH<sub>4</sub>OH, and H<sub>2</sub>O<sub>2</sub> in Figure 4 (column 8, lines 44-45).

Art Unit: 1765

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Liu in view of Morinaga by adding a surfactant, as taught by Olesen for the purpose of protecting the wafer from  $\text{NH}_4\text{OH}$  and reducing the surface tension of DI water (Olesen, column 8, lines 53-54).

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 52, 53, and 56-58 are rejected under 35 U.S.C. 102(b) as being anticipated by Ban et al. (US 5,470,461).

Ban teaches, “. . . After that, deionized water is produced by a two-bed ion exchange pure water producing apparatus 121 with a degasifier. Subsequently, ozone is added to the deionized water and reaction there between is effected in a reaction vessel 122. . .” (column 10, lines 40-49). Since Ban uses the same steps in processing water as those claimed by the applicants, then using Ban's method of processing water would inherently result in a method of forming a rinse and further reads on, the said method comprising:

degassing  $\text{H}_2\text{O}$ ; and

dissolving a gaseous oxidant comprising  $O_3$  in to said  $H_2O$ .

***Claim Rejections - 35 USC § 103***

9. Claims 67-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (US 6,063,695)

Lin teaches etching a wafer with an etchant that comprises HF and for a period of time that is experimentally determined. In the present embodiment, the time period is between about 8 and 14 minutes and after this time period the etchant is quenched by rinsing the wafer 10 with de-ionized water (column 4, lines 4-2) which reads on,

A method of processing a wafer comprising: placing said wafer in a single wafer cleaning tool; after placing said wafer in said single wafer cleaning tool, dispensing an HF solution on said wafer, dispensing a cleaning solution on said wafer immediately after dispensing said HF solution to neutralize said HF solution.

Lin differs in failing to recite dispensing an HF solution on the wafer for between 2-3 seconds, **in claim 67**.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to use any range of times in dispensing HF solution on the wafer as disclosed by the Lin reference, including using the range of times as claimed by the applicants for the purpose of quenching the etching process (Lin, column 4, lines 19-20).

***Allowable Subject Matter***

10. Claims 41-51; 59-66; 79-96; 100; 102; and 112 are allowed.
11. The following is a statement of reasons for the indication of allowable subject matter: As to claims 41-51; 59-66; 79-96; 100; 102; and 112 , the prior art of record, taken either alone or in combination, fails to disclose or render obvious:

the sequence of steps in cleaning a wafer, in claims 41-51, 59-66, 79-96, and 100;

cleaning a wafer with N,N'-Bis(2-hydroxyphenyl)ethylenediiminodiacetic acid (HPED), in claim 102; and

cleaning a wafer with molybdic acid, in claim 112, in combination with the rest of the limitation of the above claims.

***Response to Arguments***

12. Applicant's arguments with respect to claims 1-13, 15-23, 41-53, 56-96, 100, 102, 104, 106, 108 -112 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).



A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 571-272-1470. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Application/Control Number: 09/891,730

Page 9

Art Unit: 1765

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April 18, 2004

NADINE S. NORTON  
SUPERVISOR  
EXAMINER

A handwritten signature in black ink, appearing to read "N. Norton", is written over the printed name and title.